

CLAIMS

- 1 1. A method comprising
- 2 passing an electrical current through a thermistor to raise its
- 3 temperature above the temperature of oil flowing in pulses past the
- 4 thermistor,
- 5 measuring a change in temperature of the thermistor
- 6 occurring with respect to one or more of the pulses,
- 7 determining a level of oil flow corresponding to the
- 8 measured change in temperature, and
- 9 issuing a signal based on the determined flow level.
- 1 2. The method of claim 1 in which measuring the change in
- 2 temperature comprises measuring a change in voltage across the
- 3 thermistor over a period of time.
- 1 3. The method of claim 2 in which the period of time
- 2 corresponds to different portions of at least one of the pulses.
- 1 4. The method of claim 2 in which the period of time begins
- 2 at the start of one of the pulses and ends no later than the start of
- 3 the next one of the pulses.
- 1 5. The method of claim 1 in which the thermistor is housed in
- 2 a package having an area that yields an oil flow of 10 to 20 inches
- 3 per second.

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1 6. The method of claim 5 in which the area is in the range of
2 0.0005 to 0.002 square inches exposed to the flowing oil.

1 7. The method of claim 1 in which the oil is flowing in a 2-
2 cycle marine engine.

1 8. The method of claim 7 in which a signal indicative of the
2 timing of the pulses is received from an electronic control module
3 of the engine.

1 9. The method of claim 7 in which the signal based on the
2 determined flow level is sent to an electronic control module of the
3 engine.

1 10. The method of claim 1 in which the rate of pulses is as high
2 as 5Hz.

1 11. The method of claim 1 in which the rate of pulses is as low
2 as one pulse per day.

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1 12. Apparatus comprising
2 a coupling having (a) two open ends adapted for connection
3 to upstream and downstream tubes of a pulsating oil circulation
4 system of an engine and (b) a channel configured to direct the oil
5 to flow past a thermistor connected to a sensing circuit,
6 the sensing circuit comprising elements connected to
7 determine a change in a voltage across the thermistor and to
8 compare the change to a threshold.

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1 13. The apparatus of claim 12 in which the sensing circuit
2 includes a sample-and-hold circuit connected to store a voltage
3 across the thermistor.

1 14. The apparatus of claim 12 in which the sensing circuit
2 includes a delay circuit connected to provide timing signals for the
3 period over which the change in voltage is determined.

1 15. The apparatus of claim 12 in which the sensing circuit
2 comprises a microcontroller that includes an analog-to-digital
3 converter.

1 16. The apparatus of claim 12 also including ports connected to
2 carry timing and flow-state signals between the sensing circuit and
3 a control circuit of the engine.

1 17. A marine engine comprising
2 moving parts arranged to be lubricated by oil delivered
3 through a supply line from a supply of oil,

4 a pump configured to pump oil from the supply to the
5 moving parts in pulses controlled by a controller, and

6 a sensor connected to receive pulses of the oil and to detect
7 the oil flow state of the engine using a temperature sensitive
8 electronic element and a circuit that analyzes an electrical
9 parameter of the temperature sensitive element at times based on
10 the pulses of the oil.

1 18. The engine of claim 16 in which the temperature sensitive
2 electronic element comprises a thermistor.

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1 19. The engine of claim 16 in which the circuit includes an
2 electrical interface to a controller that controls the timing of the
3 pulses.

1 20. A method comprising

2 passing an electrical current through a thermo-electric
3 sensor to raise its temperature above the temperature of a non-
4 conductive or high resistance fluid flowing in pulses past the
5 sensor,

6 measuring a change in temperature of the thermo-electric
7 sensor occurring with respect to one or more of the pulses,

8 determining a level of fluid flow corresponding to the
9 measured change in temperature, and

10 issuing a signal based on the determined flow level.

1 21. The method of claim 20 in which the thermo-electric sensor
2 comprises a thermistor.

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